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Docket No.: M4065.0415/P415
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent Application of:
Kie Y. Ahn et al.

Application No.: 09/755,071

Confirmation No.: 5118

Filed: January 8, 2001

Art Unit: 2815

For: COPPER DUAL DAMASCENE
INTERCONNECT TECHNOLOGY

Examiner: George C. Eckert

APPELLANTS' REPLY BRIEF UNDER 37 C.F.R. § 41.41

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is a Reply Brief pursuant to 37 C.F.R. § 41.41 in response to the Examiner's Answer mailed April 6, 2005 in connection with the appeal from the final rejection of claims 19-28, 30, 31, 33, 34, 37 and 39-42 mailed March 22, 2004 (Paper No. 03172004) in the above-identified U.S. patent application.

The Examiner's Answer and the final rejection of claims 19-28, 30, 31, 33, 34, 37 and 39-42 are based on the assertion that Anand and Min are combinable. This assertion is unsupported.

In addressing the Appellants' argument that there is no motivation to combine Anand and Min, the Examiner's Answer notes that "while Anand does show in figure 19 the Ti-Si-N having 100% step coverage, as seen by the constant thickness of

the layer on the sidewall of the trench and via, Anand does not expressly state such limitation." (Examiner's Answer at 7). The Examiner's Answer then concludes that "Min et al. *provide motivation* for using their process when forming a Ti-Si-N layer such as that of Anand – that such formation prevents copper diffusion at high temperatures, provides 100% step coverage even in holes having high aspect ratios and allows precise control of the thickness and composition of the film." (Examiner's Answer at 8; emphasis added).

First, the assertion in the Examiner's Answer that "Anand does show in figure 19 the Ti-Si-N having 100% step coverage, as seen by the constant thickness of the layer on the sidewall of the trench and via" is unsupported. Anand simply does not disclose, teach or suggest in any way a Ti-Si-N layer having 100% step coverage. This is because the crux of Anand is not damascene processing, much less improving the characteristics of copper damascene structures, or controlling the thickness of barrier films in high aspect ratio holes. The crux of Anand is addressing bonding errors and minimizing dishing in second-level wirings, and not improving the step coverage of barrier layers in damascene structures. Appellants also note that, in fact, the final Office Action dated March 22, 2004 acknowledged that Anand does not teach a Ti-Si-N layer having 100% step coverage by clearly stating that "[t]he only thing Anand *does not teach* is the process by which the Ti-Si-N layer is deposited and thus, arguably, *the step coverage as instantly claimed*." (March 22, 2004 Office Action at 5; emphasis added). Thus, it is not clear to Appellants how, at this point during the prosecution, Anand could disclose, teach or suggest a Ti-Si-N layer having 100% step coverage.

Second, the issue is not whether the Ti-Si-N layer of Anand "may" be formed in the claimed manner (of course it *can* be– that is Appellants' invention), but rather whether there is any suggestion or motivation to form the Ti-Si-N of Anand in the

claimed manner. Appellants submit not. The statutory standard of 35 U.S.C. § 103 is whether the invention as a whole would have been obvious to one skilled in the art, not whether it would have been obvious to one skilled in the art to try various combinations. Richdel Division of Garden America Corp. v. Aqua-Trol Corp., 681 F. Supp. 141, 145 (E.D.N.Y. 1988) ("Obviousness must be established by consideration of the prior art, as well as the claimed invention, as a whole. The reference must do more than suggest that an innovation 'ought to be tried,' or is obvious in hindsight; it must itself directly suggest the desirability of a new combination.").

Thus, whether the Ti-Si-N layer *could* have been formed by MOALD in Anand is not determinative of patentability. As in Richdel Division, Anand must directly suggest the desirability of forming the Ti-Si-N layer by MOALD, and Anand fails to do that. In fact, and as noted above, Anand addresses bonding errors such as dishing that occur as a result of chemical mechanical polishing (CMP) techniques, and not achieving "near perfect step coverage," as in Min. Accordingly, the fact that Min teaches a Ti-Si-N layer by MOALD does not by itself motivate one skilled in the art to modify Anand to achieve the subject matter of claims 19-28, 30, 31, 33, 34, 37 and 39-42.

Appellants respectfully submit that the references of record do not establish *prima facie* obviousness. Reversal of the final rejection of claims 19-28, 30, 31, 33, 34, 37 and 39-42 is accordingly respectfully requested.

Dated: May 16, 2005

Respectfully submitted,

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